

# Time Series, Wet Bulb Temperatures

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This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>. ## Including Plots

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

```
getwd()
```

```
## [1] "/home/guest/R/Patton_Guimond_ENV872_Final_Project"
```

```
#load packages
```

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.2 --
## v ggplot2 3.3.6      v purrr   0.3.4
## v tibble  3.1.8      v dplyr  1.0.10
## v tidyr   1.2.0      v stringr 1.4.1
## v readr   2.1.2      v forcats 0.5.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
##
## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union
```

```
library(zoo)
```

```
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric
```

```

library(ggplot2)
library(trend)
library(Kendall)
library(tseries)

## Registered S3 method overwritten by 'quantmod':
##   method      from
##   as.zoo.data.frame zoo

library(dplyr)

#Load Jackson Data
Jackson_Raw <- read.csv("~/R/Patton_Guimond_ENV872_Final_Project/Jackson_TenYear.csv",
                        stringsAsFactors = TRUE)
Jackson_Wrangle <- Jackson_Raw %>%
  select(YEAR, MO, DAY, WBGTC) %>%
  mutate('date' = make_date(year = YEAR, month = MO, day = DAY))

#Set as date
Jackson_Wrangle$date <- as.Date(Jackson_Wrangle$date, format = "%y/%m/%d")

#Group by date and find max daily temperature
Daily_High <- Jackson_Wrangle %>%
  group_by(date) %>%
  dplyr::summarize(value = max (WBGTC)) %>%
  as.data.frame()

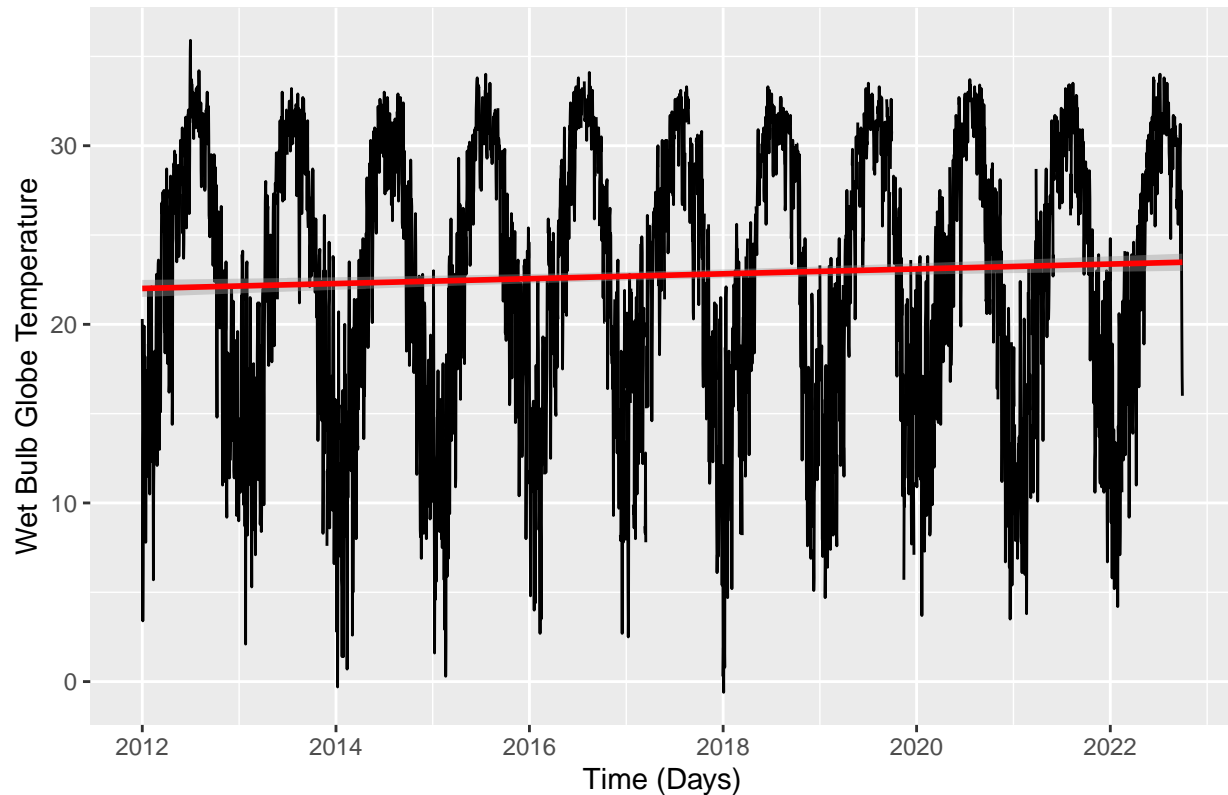
#Plot max temperatures over time
MaxWBTG_Plot <- ggplot(Daily_High, aes(x = date, y = value)) +
  geom_line()+
  geom_smooth(method=lm, col= 'red')+
  ggtitle("Max Wet Bulb Over Time")+
  xlab("Time (Days)") + ylab("Wet Bulb Globe Temperature")
print(MaxWBTG_Plot)

## 'geom_smooth()' using formula 'y ~ x'

## Warning: Removed 125 rows containing non-finite values (stat_smooth).

```

## Max Wet Bulb Over Time



```
#Look for NA values in data and remove
summary(Daily_High$value)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##    -0.60  17.20   23.80   22.74  29.50   35.90    125
```

```
Clean_WetBulb <-
  Daily_High %>%
  mutate(WBGT_Clean = zoo::na.approx(value))
summary(Clean_WetBulb)
```

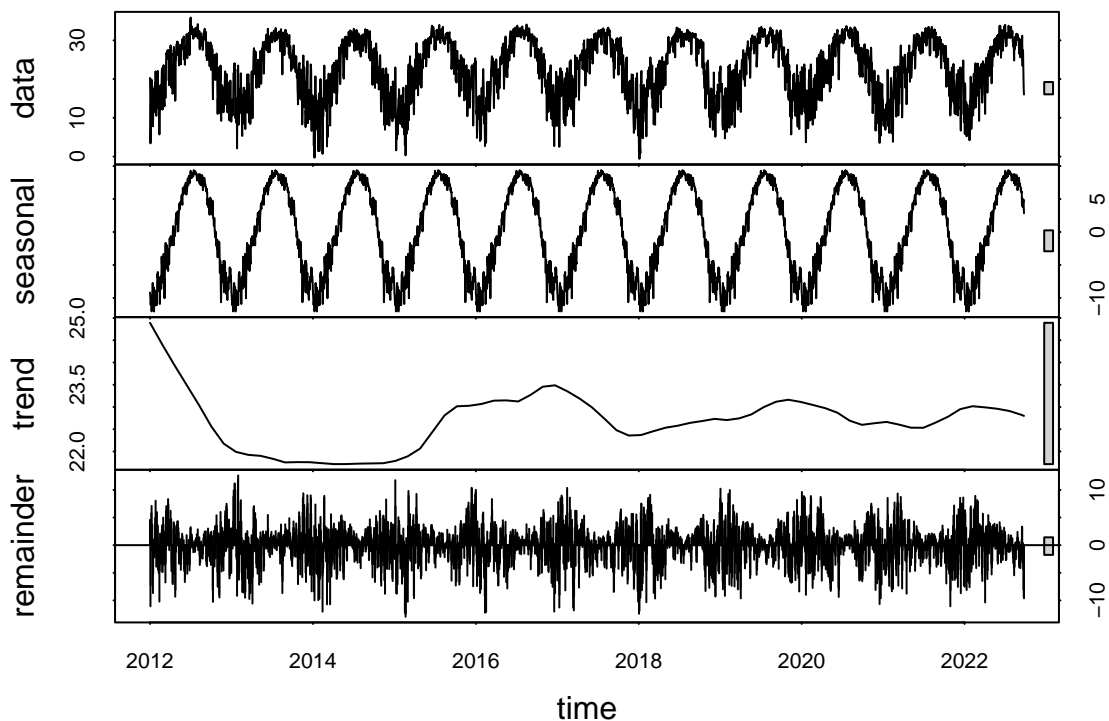
```
##      date          value      WBGT_Clean
##  Min.   :2012-01-01  Min.   : -0.60   Min.   : -0.60
## 1st Qu.:2014-09-06  1st Qu.:17.20   1st Qu.:17.20
## Median :2017-05-13  Median :23.80   Median :23.80
## Mean   :2017-05-14  Mean   :22.74   Mean   :22.75
## 3rd Qu.:2020-01-19  3rd Qu.:29.50   3rd Qu.:29.50
## Max.   :2022-09-30  Max.   :35.90   Max.   :35.90
##                      NA's   :125
```

```
#Filter for date and NA omitted Temp
Max_WetBulb <- Clean_WetBulb%>%
  select(date, WBGT_Clean)
summary(Max_WetBulb)
```

```
##      date      WBGTC_Clean
## Min.   :2012-01-01  Min.   : -0.60
## 1st Qu.:2014-09-06  1st Qu.:17.20
## Median :2017-05-13  Median :23.80
## Mean   :2017-05-14  Mean    :22.75
## 3rd Qu.:2020-01-19  3rd Qu.:29.50
## Max.   :2022-09-30  Max.    :35.90
```

```
#Create Time series object and decompose
```

```
Daily_High_ts <- ts(Max_WetBulb$WBGTC_Clean, start = c(2012,01,01), frequency = 365)
Daily_High_decomp <- stl(Daily_High_ts,s.window = "periodic")
plot(Daily_High_decomp)
```



```
Daily_WetBulb_Trend <- Kendall::SeasonalMannKendall(Daily_High_ts)
summary(Daily_WetBulb_Trend)
```

```
## Score = 601 , Var(Score) = 56149
## denominator = 19016.47
## tau = 0.0316, 2-sided pvalue =0.011203
```

```
#Subtract seasonality and run seasonally adjusted Mann Kendall
```

```
Daily_Components <- as.data.frame(Daily_High_decomp$time.series[,1:3])
```

```
Daily_Components <- mutate(Daily_Components,
  WBGTC = Max_WetBulb$WBGTC_Clean,
  Date = Max_WetBulb$date)

WetBulb_SeasonAdj <- Daily_Components %>%
  mutate(Subtract.Season = Daily_Components$WBGTC - Daily_Components$seasonal)
summary(WetBulb_SeasonAdj)
```

```
##      seasonal      trend      remainder      WBGTC
## Min.      :-12.05802 Min.      :21.72 Min.      :-12.96412 Min.      :-0.60
## 1st Qu.: -6.43466 1st Qu.:22.36 1st Qu.: -2.02813 1st Qu.:17.20
## Median :  0.09436 Median :22.71 Median :  0.27878 Median :23.80
## Mean   :  0.08434 Mean   :22.67 Mean   : -0.01004 Mean   :22.75
## 3rd Qu.:  6.69065 3rd Qu.:23.03 3rd Qu.:  2.06973 3rd Qu.:29.50
## Max.    :  9.38170 Max.    :24.89 Max.    : 12.62108 Max.    :35.90
##      Date      Subtract.Season
## Min.      :2012-01-01 Min.      : 8.91
## 1st Qu.:2014-09-06 1st Qu.:20.59
## Median :2017-05-13 Median :22.92
## Mean   :2017-05-14 Mean   :22.66
## 3rd Qu.:2020-01-19 3rd Qu.:24.73
## Max.    :2022-09-30 Max.    :34.60
```

```
NonSeasonal_WetBulb_Trend <- Kendall::MannKendall(WetBulb_SeasonAdj$Subtract.Season)
summary(NonSeasonal_WetBulb_Trend)
```

```
## Score = 225369 , Var(Score) = 6680122368
## denominator = 7669408
## tau = 0.0294, 2-sided pvalue =0.0058262
```

```
#Load Jackson Data
KFSI_Clean <- read.csv("~/R/Patton_Guimond_ENV872_Final_Project/KFSI_Clean.csv",
  stringsAsFactors = TRUE)
KFSI_Wrangle <- KFSI_Clean %>%
  select(Year, Month, Day, Derived.Wet.Bulb.Globe.Temperature..F.) %>%
  mutate('date' = make_date(year = Year, month = Month, day = Day))

#Set as date
KFSI_Wrangle$date <- as.Date(KFSI_Wrangle$date, format = "%y/%m/%d")
KFSI_Wrangle_Update <- KFSI_Wrangle %>%
  select(date, Derived.Wet.Bulb.Globe.Temperature..F.)

#Group by date and find max daily temperature
Daily_High_KFSI <- KFSI_Wrangle_Update %>%
  group_by(date) %>%
  dplyr::summarize(value = max (Derived.Wet.Bulb.Globe.Temperature..F.)) %>%
  as.data.frame()

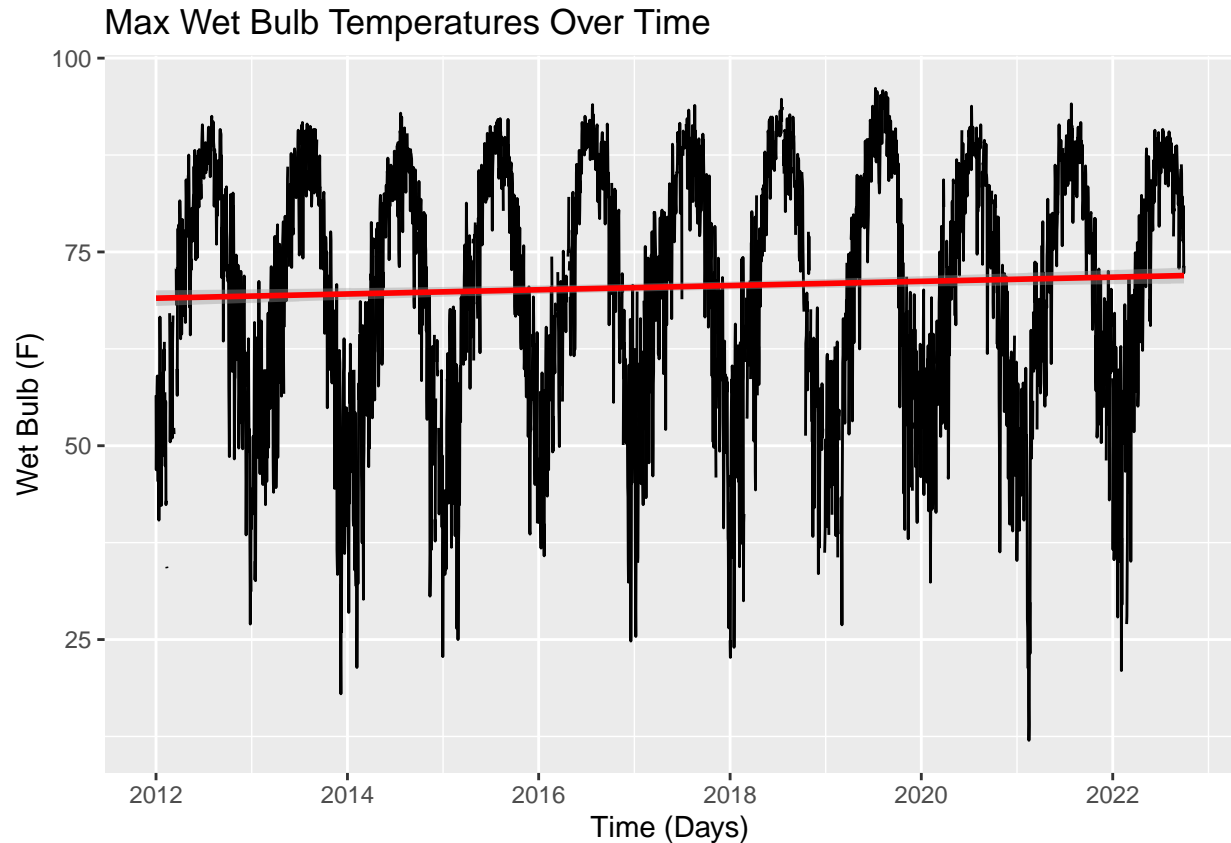
#Plot max temperatures over time
KFSI_Max_WetBulb_Plot <- ggplot(Daily_High_KFSI, aes(x = date, y = value)) +
  geom_line()+
  geom_smooth(method=lm, col= 'red')+
  ggtitle("Max Wet Bulb Temperatures Over Time")+
```

```
xlab("Time (Days)") + ylab("Wet Bulb (F)")
print(KFSI_Max_WetBulb_Plot)
```

```
## 'geom_smooth()' using formula 'y ~ x'
```

```
## Warning: Removed 187 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 1 row(s) containing missing values (geom_path).
```



```
#Look for NA values in data and remove
summary(Daily_High_KFSI$value)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
##      12.00   58.73   72.90   70.49   84.50   96.10     187
```

```
KFSI_Filtered_Date <- Daily_High_KFSI %>%
  filter(between(date, as.Date("2012-01-10"), as.Date("2022-09-30")))
```

```
Clean_Max_WetBulb_KSFI <-
  KFSI_Filtered_Date %>%
  mutate(Wet_Bulb = zoo::na.approx(value))
summary(Clean_Max_WetBulb_KSFI)
```

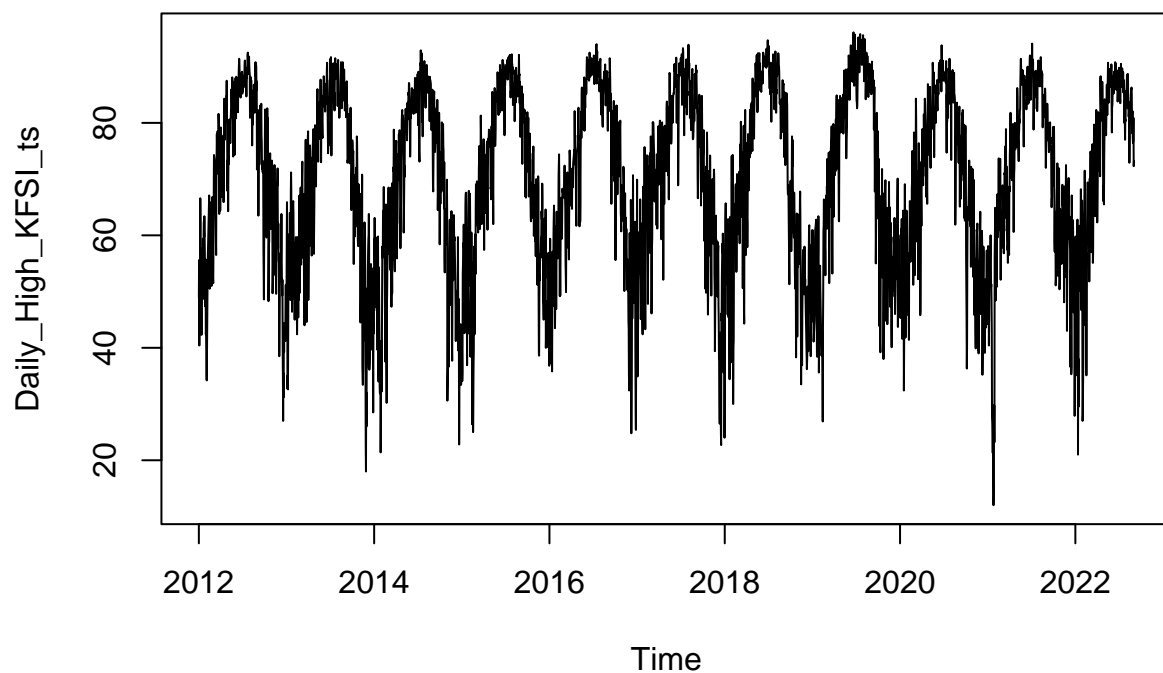
```
##      date           value      Wet_Bulb
## Min.   :2012-01-10   Min.   :12.00   Min.   :12.0
## 1st Qu.:2014-09-10   1st Qu.:58.80   1st Qu.:58.6
## Median :2017-05-13   Median :73.00   Median :72.6
## Mean   :2017-05-17   Mean   :70.53   Mean   :70.3
## 3rd Qu.:2020-01-20   3rd Qu.:84.50   3rd Qu.:84.3
## Max.   :2022-09-30   Max.   :96.10   Max.   :96.1
##                      NA's    :186
```

```
Clean_Max_WetBulb_KSFI <- Clean_Max_WetBulb_KSFI %>%
  select(date,Wet_Bulb)
summary(Clean_Max_WetBulb_KSFI)
```

```
##      date           Wet_Bulb
## Min.   :2012-01-10   Min.   :12.0
## 1st Qu.:2014-09-10   1st Qu.:58.6
## Median :2017-05-13   Median :72.6
## Mean   :2017-05-17   Mean   :70.3
## 3rd Qu.:2020-01-20   3rd Qu.:84.3
## Max.   :2022-09-30   Max.   :96.1
```

```
#Create Time series object and decompose
```

```
Daily_High_KFSI_ts <- ts(Clean_Max_WetBulb_KSFI$Wet_Bulb, start = c(2012,01,01), frequency = 365)
Daily_High_KFSI_decomp <- stl(Daily_High_KFSI_ts,s.window = "periodic")
plot(Daily_High_KFSI_ts)
```



```
Daily_Temp_Trend_KFSI <- Kendall::SeasonalMannKendall(Daily_High_KFSI_ts)
summary(Daily_Temp_Trend_KFSI)
```

```
## Score = 1106 , Var(Score) = 55324
## denominator = 18825.18
## tau = 0.0588, 2-sided pvalue =2.5741e-06
```

```
#Subtract seasonality and run seasonally adjusted Mann Kendall
```

```
Daily_Components_KFSI <- as.data.frame(Daily_High_KFSI_decomp$time.series[,1:3])
```

```
Daily_Components_KFSI <- mutate(Daily_Components_KFSI,
  Wet_Bulb_F = Clean_Max_WetBulb_KSFI$Wet_Bulb,
  Date = Clean_Max_WetBulb_KSFI$date)
```

```
TempSeasonAdj_KFSI <- Daily_Components_KFSI %>%
  mutate(Subtract.Season = Daily_Components_KFSI$Wet_Bulb_F - Daily_Components_KFSI$seasonal)
summary(TempSeasonAdj_KFSI)
```

```
##      seasonal      trend      remainder      Wet_Bulb_F
## Min.    :-25.7657 Min.    :67.32 Min.    :-34.45664 Min.    :12.0
## 1st Qu.: -13.0419 1st Qu.:69.01 1st Qu.: -3.41231 1st Qu.:58.6
## Median :  1.3529 Median :70.33 Median :  0.53595 Median :72.6
## Mean    :  0.2568 Mean    :70.04 Mean    :  0.00451 Mean    :70.3
## 3rd Qu.: 14.4074 3rd Qu.:71.06 3rd Qu.:  4.16777 3rd Qu.:84.3
## Max.    : 19.8934 Max.    :72.29 Max.    : 22.33340 Max.    :96.1
##      Date      Subtract.Season
## Min.    :2012-01-10 Min.    :34.28
## 1st Qu.:2014-09-10 1st Qu.:66.52
## Median :2017-05-13 Median :70.57
## Mean    :2017-05-17 Mean    :70.04
## 3rd Qu.:2020-01-20 3rd Qu.:74.38
## Max.    :2022-09-30 Max.    :94.32
```

```
NonSeasonal_Temp_Trend_KFSI <- Kendall::MannKendall(TempSeasonAdj_KFSI$Subtract.Season)
summary(NonSeasonal_Temp_Trend_KFSI)
```

```
## Score = 306922 , Var(Score) = 6568209920
## denominator = 7583515
## tau = 0.0405, 2-sided pvalue =0.00015247
```

```
#Load Data
```

```
KLSF_Clean <- read.csv("~/R/Patton_Guimond_ENV872_Final_Project/KLSF_Clean.csv",
  stringsAsFactors = TRUE)
```

```
KLSF_Wrangle <- KLSF_Clean %>%
  select(Year, Month, Day, Derived.Wet.Bulb.Globe.Temperature..F.) %>%
  mutate('date' = make_date(year = Year, month = Month, day = Day))
```

```
#Set as date
```

```
KLSF_Wrangle$date <- as.Date(KLSF_Wrangle$date, format = "%y/%m/%d")
KLSF_Wrangle_Update <- KLSF_Wrangle %>%
```



```

select(date, Derived.Wet.Bulb.Globe.Temperature..F.)

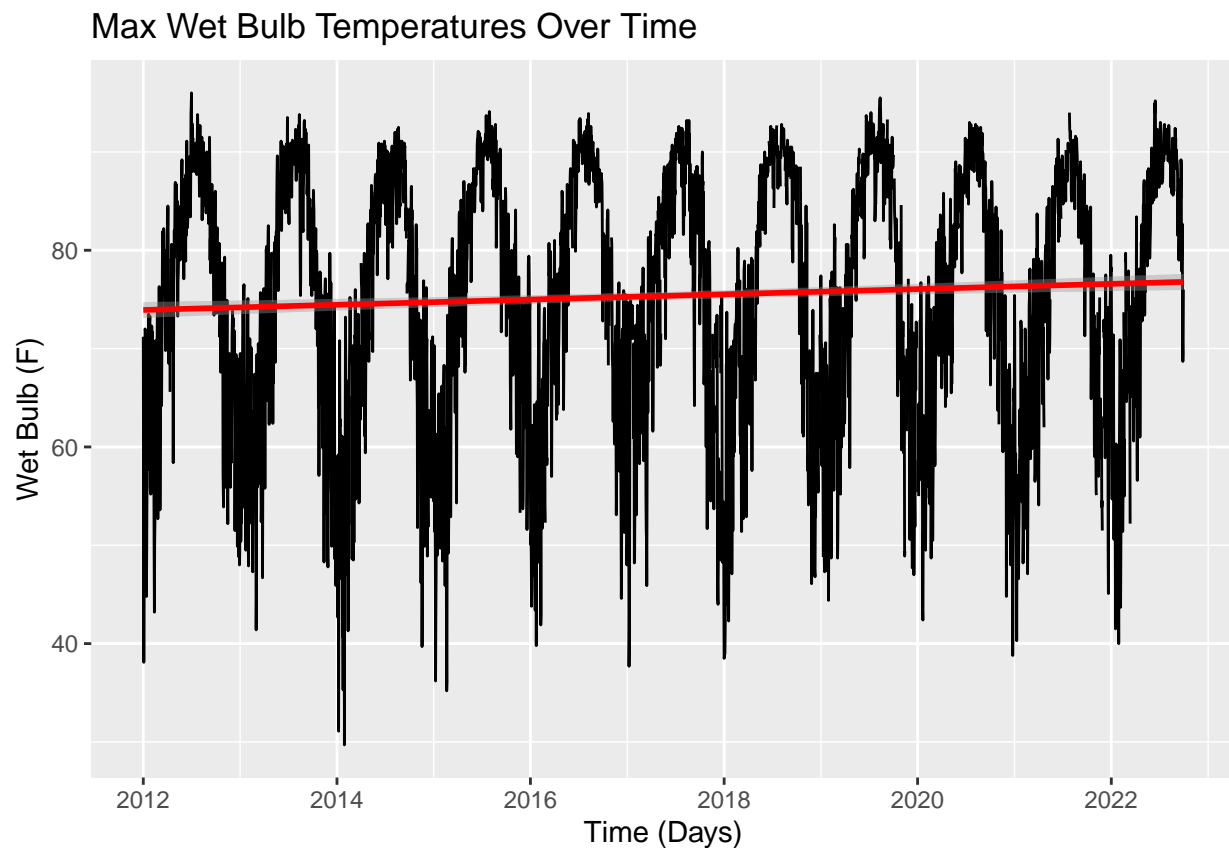
#Group by date and find max daily temperature
Daily_High_KLSF <- KLSF_Wrangle_Update %>%
  group_by(date) %>%
  dplyr::summarize(value = max (Derived.Wet.Bulb.Globe.Temperature..F.)) %>%
  as.data.frame()
#Plot max temperatures over time
KLSF_Max_Wet_Bulb_Plot <- ggplot(Daily_High_KLSF, aes(x = date, y = value)) +
  geom_line()+
  geom_smooth(method=lm, col= 'red')+
  ggtitle("Max Wet Bulb Temperatures Over Time")+
  xlab("Time (Days)") + ylab("Wet Bulb (F)")
print(KLSF_Max_Wet_Bulb_Plot)

```

```
## 'geom_smooth()' using formula 'y ~ x'
```

```
## Warning: Removed 95 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 1 row(s) containing missing values (geom_path).
```



```

#Look for NA values in data and remove
summary(Daily_High_KLSF$value)

```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
##    29.70   66.20   77.60   75.34   86.65   96.00      95
```

```
KLSF_Filtered_Date <- Daily_High_KLSF %>%
  filter(between(date, as.Date("2012-01-10"), as.Date("2022-09-30")))
```

```
Clean_Max_WetBulb_KLSF <-
  KLSF_Filtered_Date %>%
  mutate(Wet_Bulb = zoo::na.approx(value))
summary(Clean_Max_WetBulb_KLSF)
```

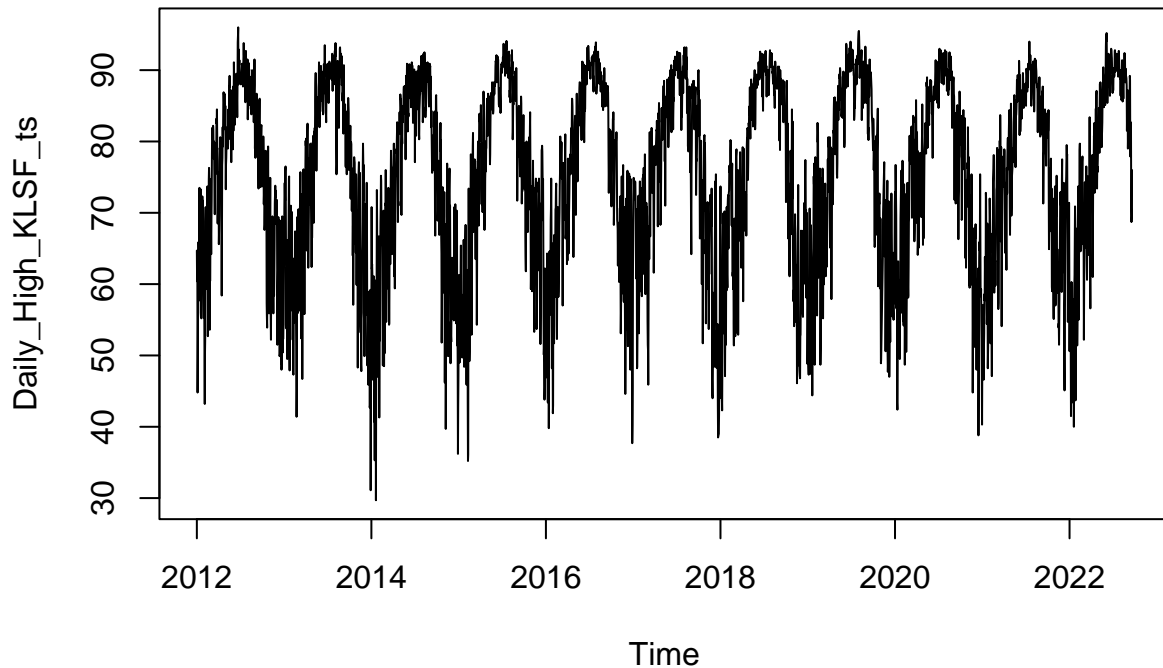
```
##      date              value      Wet_Bulb
##  Min.   :2012-01-10   Min.   :29.70   Min.   :29.7
##  1st Qu.:2014-09-15   1st Qu.:66.22   1st Qu.:66.2
##  Median :2017-05-21   Median :77.60   Median :77.4
##  Mean   :2017-05-20   Mean   :75.38   Mean   :75.3
##  3rd Qu.:2020-01-24   3rd Qu.:86.70   3rd Qu.:86.6
##  Max.   :2022-09-30   Max.   :96.00   Max.   :96.0
##                      NA's    :94
```

```
Clean_Max_WetBulb_KLSF <- Clean_Max_WetBulb_KLSF %>%
  select(date, Wet_Bulb)
summary(Clean_Max_WetBulb_KLSF)
```

```
##      date              Wet_Bulb
##  Min.   :2012-01-10   Min.   :29.7
##  1st Qu.:2014-09-15   1st Qu.:66.2
##  Median :2017-05-21   Median :77.4
##  Mean   :2017-05-20   Mean   :75.3
##  3rd Qu.:2020-01-24   3rd Qu.:86.6
##  Max.   :2022-09-30   Max.   :96.0
```

```
#Create Time series object and decompose
```

```
Daily_High_KLSF_ts <- ts(Clean_Max_WetBulb_KLSF$Wet_Bulb, start = c(2012,01,01), frequency = 365)
Daily_High_KLSF_decomp <- stl(Daily_High_KLSF_ts, s.window = "periodic")
plot(Daily_High_KLSF_ts)
```



```
Daily_Temp_Trend_KLSF <- Kendall::SeasonalMannKendall(Daily_High_KLSF_ts)
summary(Daily_Temp_Trend_KLSF)
```

```
## Score = 609 , Var(Score) = 55991.67
## denominator = 18988.64
## tau = 0.0321, 2-sided pvalue =0.010062
```

```
#Subtract seasonality and run seasonally adjusted Mann Kendall
```

```
Daily_Components_KLSF <- as.data.frame(Daily_High_KLSF_decomp$time.series[,1:3])
```

```
Daily_Components_KLSF <- mutate(Daily_Components_KLSF,
  Wet_Bulb = Clean_Max_WetBulb_KLSF$Wet_Bulb,
  Date = Clean_Max_WetBulb_KLSF$date)
```

```
TempSeasonAdj_KLSF <- Daily_Components_KLSF %>%
  mutate(Subtract.Season = Daily_Components_KLSF$Wet_Bulb - Daily_Components_KLSF$seasonal)
summary(TempSeasonAdj_KLSF)
```

##	seasonal	trend	remainder	Wet_Bulb
## Min.	:-23.92826	Min. :73.38	Min. : -25.75377	Min. :29.7
## 1st Qu.	:-10.43679	1st Qu.:74.39	1st Qu.: -3.40536	1st Qu.:66.2
## Median :	0.03123	Median :75.30	Median : 0.40802	Median :77.4
## Mean :	0.20194	Mean :75.11	Mean : -0.01792	Mean :75.3
## 3rd Qu.:	11.47974	3rd Qu.:75.75	3rd Qu.: 3.59139	3rd Qu.:86.6
## Max.	: 15.98621	Max. :77.75	Max. : 22.59372	Max. :96.0

```
##      Date      Subtract.Season
## Min.   :2012-01-10   Min.     :48.63
## 1st Qu.:2014-09-15   1st Qu.:71.68
## Median :2017-05-21   Median  :75.54
## Mean   :2017-05-20   Mean    :75.09
## 3rd Qu.:2020-01-24   3rd Qu.:78.77
## Max.   :2022-09-30   Max.    :96.47
```

```
NonSeasonal_Temp_Trend_KLSF <- Kendall::MannKendall(TempSeasonAdj_KLSF$Subtract.Season)
summary(NonSeasonal_Temp_Trend_KLSF)
```

```
## Score = 185144 , Var(Score) = 6654576640
## denominator = 7649859
## tau = 0.0242, 2-sided pvalue =0.023233
```

```
#Load Data
KTBN_Clean <- read.csv("~/R/Patton_Guimond_ENV872_Final_Project/KTBN_Clean.csv",
                      stringsAsFactors = TRUE)
KTBN_Wrangle <- KTBN_Clean %>%
  select(Year, Month, Day, Derived.Wet.Bulb.Globe.Temperature..F.) %>%
  mutate('date' = make_date(year = Year, month = Month, day = Day))

#Set as date
KTBN_Wrangle$date <- as.Date(KTBN_Wrangle$date, format = "%y/%m/%d")
KTBN_Wrangle_Update <- KTBN_Wrangle %>%
  select(date, Derived.Wet.Bulb.Globe.Temperature..F.)

#Group by date and find max daily temperature
Daily_High_KTBN <- KTBN_Wrangle_Update %>%
  group_by(date) %>%
  dplyr::summarize(value = max (Derived.Wet.Bulb.Globe.Temperature..F.)) %>%
  as.data.frame()

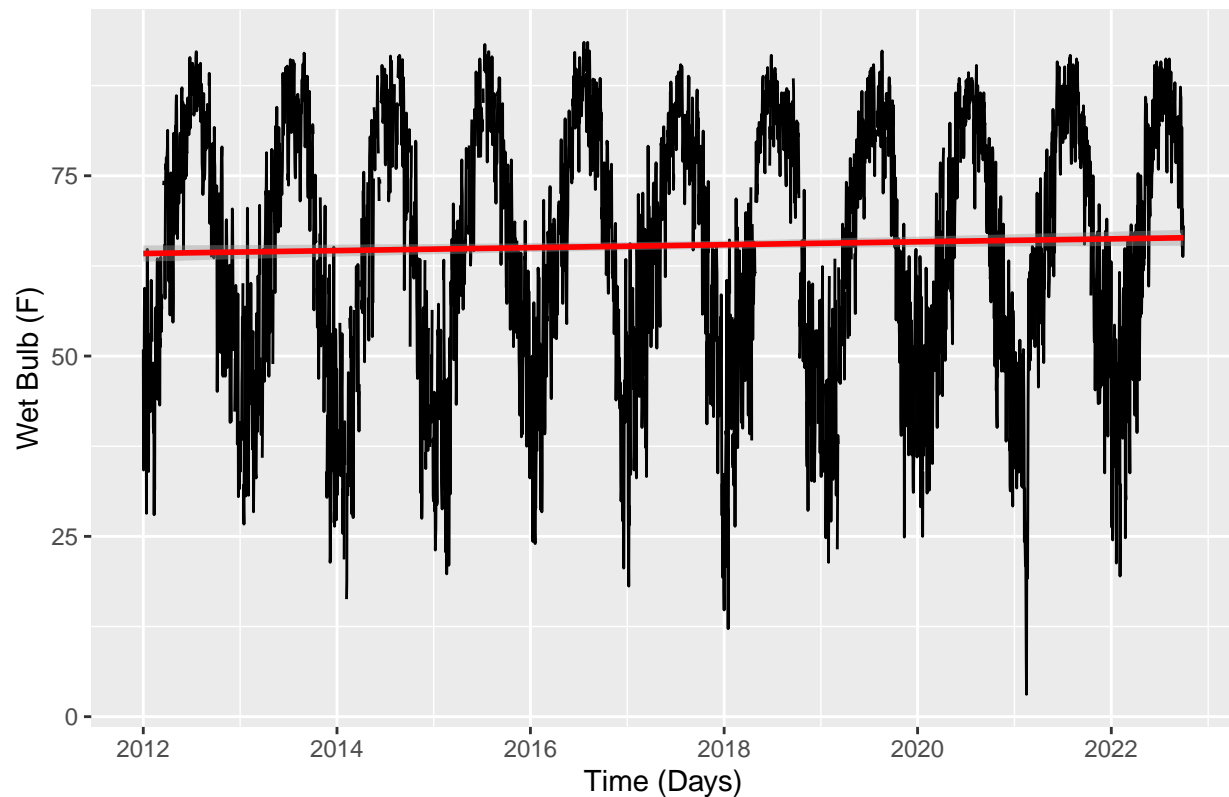
#Plot max temperatures over time
KTBN_Max_WetBulb_Plot <- ggplot(Daily_High_KTBN, aes(x = date, y = value)) +
  geom_line()+
  geom_smooth(method=lm, col= 'red')+
  ggtitle("Wet Bulb Temperatures Over Time")+
  xlab("Time (Days)") + ylab("Wet Bulb (F)")
print(KTBN_Max_WetBulb_Plot)
```

```
## 'geom_smooth()' using formula 'y ~ x'
```

```
## Warning: Removed 163 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 1 row(s) containing missing values (geom_path).
```

## Wet Bulb Temperatures Over Time



```
#Look for NA values in data and remove
summary(Daily_High_KTBN$value)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      3.10  52.40   67.10   65.32  80.80   93.50   163
```

```
KTBN_Filtered_Date <- Daily_High_KTBN %>%
  filter(between(date, as.Date("2012-01-10"), as.Date("2022-09-30")))
```

```
Clean_Max_WetBulb_KTBN <-
  KTBN_Filtered_Date %>%
  mutate(Wet_Bulb = zoo::na.approx(value))
summary(Clean_Max_WetBulb_KTBN)
```

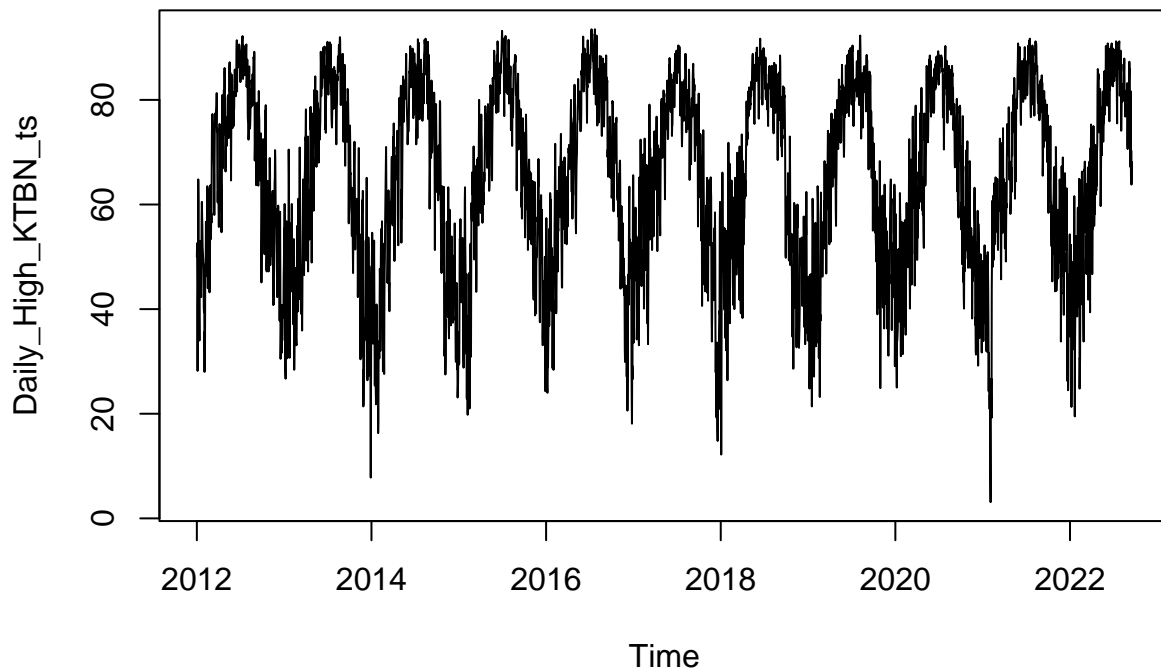
```
##      date          value      Wet_Bulb
##  Min.   :2012-01-10  Min.    : 3.10   Min.    : 3.10
## 1st Qu.:2014-09-16  1st Qu.:52.40  1st Qu.:52.20
## Median :2017-05-21  Median :67.20  Median :67.03
## Mean   :2017-05-21  Mean   :65.36  Mean   :65.21
## 3rd Qu.:2020-01-25  3rd Qu.:80.90  3rd Qu.:80.60
## Max.   :2022-09-30  Max.    :93.50  Max.    :93.50
##                      NA's    :162
```

```
Clean_Max_WetBulb_KTBN <- Clean_Max_WetBulb_KTBN %>%
  select(date,Wet_Bulb)
summary(Clean_Max_WetBulb_KTBN)
```

```
##      date      Wet_Bulb
## Min.   :2012-01-10   Min.   : 3.10
## 1st Qu.:2014-09-16   1st Qu.:52.20
## Median :2017-05-21   Median :67.03
## Mean   :2017-05-21   Mean    :65.21
## 3rd Qu.:2020-01-25   3rd Qu.:80.60
## Max.   :2022-09-30   Max.    :93.50
```

```
#Create Time series object and decompose
```

```
Daily_High_KTBN_ts <- ts(Clean_Max_WetBulb_KTBN$Wet_Bulb, start = c(2012,01,01), frequency = 365)
Daily_High_KTBN_decomp <- stl(Daily_High_KTBN_ts,s.window = "periodic")
plot(Daily_High_KTBN_ts)
```



```
Daily_WetBulb_Trend_KTBN <- Kendall::SeasonalMannKendall(Daily_High_KTBN_ts)
summary(Daily_WetBulb_Trend_KTBN)
```

```
## Score = 34 , Var(Score) = 55954
## denominator = 18989.31
## tau = 0.00179, 2-sided pvalue =0.88571
```

```

#Subtract seasonality and run seasonally adjusted Mann Kendall
Daily_Components_KTBN <- as.data.frame(Daily_High_KTBN_decomp$time.series[,1:3])

Daily_Components_KTBN <- mutate(Daily_Components_KTBN,
  Wet_Bulb = Clean_Max_WetBulb_KTBN$Wet_Bulb,
  Date = Clean_Max_WetBulb_KTBN$date)

TempSeasonAdj_KTBN <- Daily_Components_KTBN %>%
  mutate(Subtract.Season = Daily_Components_KTBN$Wet_Bulb - Daily_Components_KTBN$seasonal)
summary(TempSeasonAdj_KTBN)

```

```

##      seasonal      trend      remainder      Wet_Bulb
## Min.    :-26.6963  Min.    :62.58  Min.    :-37.00668  Min.    : 3.10
## 1st Qu.: -14.4772  1st Qu.:64.02  1st Qu.: -4.84262  1st Qu.:52.20
## Median :  0.3754  Median :64.69  Median :  0.64879  Median :67.03
## Mean    :  0.2871  Mean    :64.93  Mean    : -0.01288  Mean    :65.21
## 3rd Qu.: 16.4647  3rd Qu.:65.95  3rd Qu.:  4.99144  3rd Qu.:80.60
## Max.    : 22.6084  Max.    :69.90  Max.    : 28.77118  Max.    :93.50
##      Date      Subtract.Season
## Min.    :2012-01-10  Min.    :27.06
## 1st Qu.:2014-09-16  1st Qu.:60.07
## Median :2017-05-21  Median :65.49
## Mean    :2017-05-21  Mean    :64.92
## 3rd Qu.:2020-01-25  3rd Qu.:69.89
## Max.    :2022-09-30  Max.    :95.68

```

```

NonSeasonal_Wet_Bulb_Trend_KTBN <- Kendall::MannKendall(TempSeasonAdj_KTBN$Subtract.Season)
summary(NonSeasonal_Wet_Bulb_Trend_KTBN)

```

```

## Score = 15063 , Var(Score) = 6644377088
## denominator = 7642058
## tau = 0.00197, 2-sided pvalue =0.8534

```